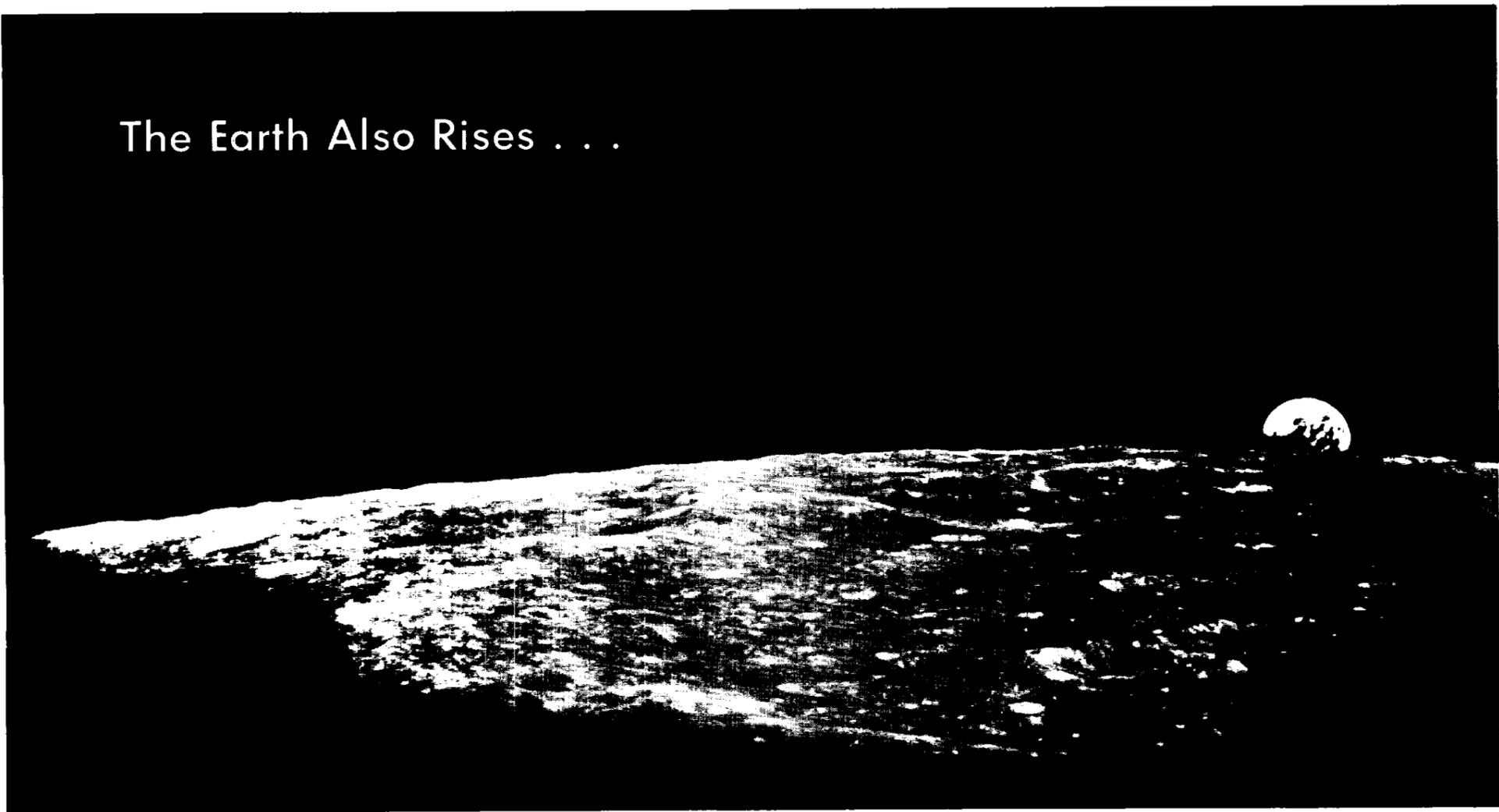


The Earth Also Rises . . .



Apollo IX Launch Date Set For February 28

The Apollo IX mission, scheduled for launch February 28, will evaluate in earth orbit the performance of the Apollo lunar module. Apollo IX is planned for liftoff at 10 am CST from Kennedy Space Center Launch Complex 39A. Crewmen are commander James McDivitt, command module pilot David Scott and lunar module pilot Russell Schweikart.

Apollo IX will be the first manned mission with the lunar module.

Following insertion into a 109x112 nm earth orbit, the Apollo IX crew will perform a simulated translunar injection, followed by separation and transposition of the command and service module and docking with the lunar module attached to the S-IVB third stage.

After docking, the crew will extract the LM from the adapter section and maneuver away from the S-IVB. A restart of the S-IVB's J-2 engine some 80 minutes after the earth orbit insertion burn will inject the stage into an earth escape trajectory.

The first burn of the spacecraft service propulsion engine will take place prior to S-IVB restart and will raise Apollo IX's orbit to 113x131 nm.

Three SPS burns are planned during the second day in orbit to obtain proper rendezvous lighting later in the mission. Apollo IX will be in a 115x271 nm orbit after the third burn.

During the third mission day, McDivitt and Schweikart will man the LM to power up and check out the spacecraft's systems. A 367-second LM descent engine burn (docked with CSM) will test LM attitude control and engine throttling. The LM crew will transfer back to the command module and an SPS burn will circularize the orbit at 133 nm.

McDivitt and Schweikart on the fourth day again will man the LM. Schweikart will go EVA through the LM front hatch to evaluate outside transfer back to the command module, collect thermal samples on the LM exterior, evaluate EVA lighting and conduct photographic tasks. The crew will then power down the LM and return to the command module through the docking tunnel.

Schweikart's EVA will be the only one in Apollo until the first lunar landing.

(Continued on page 3)

ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

VOL. 8, NO. 6

JANUARY 10, 1969



Apollo VIII's Moon Voyage Brings Home Cargo of Data

Never before had three men been so far away from home as Apollo VIII crewmen Frank Borman, James Lovell and Bill Anders were on Christmas morning when they fired up the spacecraft's service propulsion system engine behind the moon

for the long coast home toward earth. And never before had a manned spaceflight gone as smoothly.

From the on-time liftoff at 6:51 am CST December 21 to splashdown in mid-Pacific 147 hours later, the Saturn V launch

vehicle and the Apollo spacecraft performed without any failures or "glitches." Apollo VIII was the first manned flight to use the Saturn V and the first time a manned vehicle had been boosted out of near-earth orbit toward another celestial body.

Apollo VIII was inserted into a 99x103 nm earth parking orbit following a near-perfect count-down for the launch. The "go" for the translunar injection burn was passed up to the crew by spacecraft communicator Mike Collins through the Carnarvon, Australia MSFN station midway through the second earth orbit.

The translunar injection burn restart of the S-IVB third stage was tracked by the Apollo instrumentation ship *Mercury*. The burn added 10,500 feet per second to the spacecraft's velocity to place it on an intercept course with the moon. A 24-foot per second midcourse correction maneuver six hours after injection and a two-foot per second correction eight hours before lunar orbit insertion tuned up the translunar coast to reach a pericynthian of 60.4 nm.

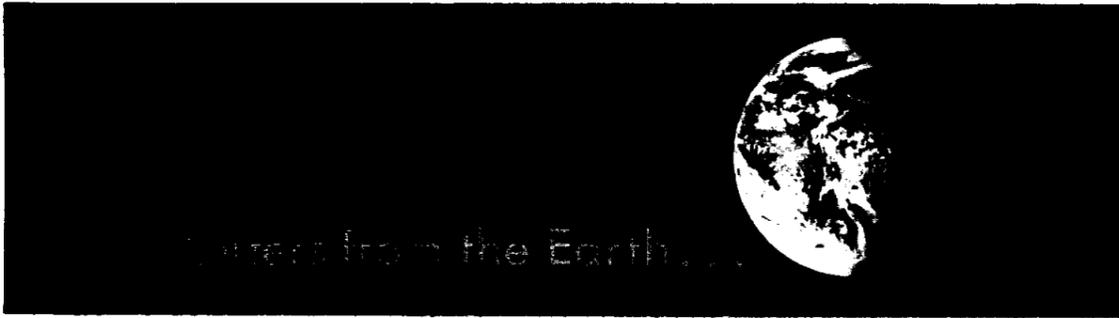
Two intermediate midcourse corrections, one at 25 hours after injection and one at 22 hours before lunar orbit insertion, were omitted because of the small amount of velocity change needed as indicated by ground tracking.

A 2994-foot per second retrograde burn near pericynthian placed Apollo VIII in a 60.4x

(Continued on page 4)



JUBILATION—The Stars and Stripes, traditional victory cigars and applause follow Apollo VIII splashdown and recovery as program management watches a telecast from the deck of the *Yorktown* in mid-Pacific. Front row, left to right, are MSC Director Robert R. Gilruth, Director of Flight Operations Christopher C. Kraft, Jr., Apollo Spacecraft Program manager George M. Low. Back Row: DOD Manager of Manned Space Flight Support Operations Maj. Gen. Vincent Huston, Apollo VIII Mission Director William C. Schneider, MSC Deputy Director George S. Trimble, Apollo Program manager Samuel C. Phillips and Deputy Associate Administrator for Manned Space Flight Charles W. Mathews.



Following are excerpts from a small fraction of the letters and telegrams that have streamed into MSC since Apollo VIII splashdown. Senders range from citizens expressing their congratulations to heads of state, scientists and aerospace leaders around the world.

Congratulations from the National Space Club on this historic achievement of the first men to orbit the moon.
—James M. Murray, president NSC

From Portugal, the country who first revealed new continents to Europe, I send you warmest congratulations on the success of Apollo VIII. And in the name of the scientists and technicians of my Board, I salute the astronauts and their distinguished collaborators.

—Leite Pinto, President of the Portuguese National Board of Scientific and Technological Research

Thank you for the astronauts' Christmas Eve message from space. God bless them.

—R. E. Hohmann, Poughkeepsie, N.Y.

You and your colleagues have just completed the greatest peaceful conquest in the history of man. Even more dramatic, you have demonstrated to all skeptics on this earth that through peaceful space exploration there are still new worlds to conquer.

—Richard Nixon, President-Elect

The first lunarnauts, Frank Borman, James Lovell and William Anders, deserve the highest praise for being the first human beings to circle around the moon, and to have the courage and the presence of mind to act promptly through various stages of the spacecraft travels on this previously-uncharted adventure. We would also like to congratulate all those controllers on the ground who had to make some vital decisions at various stages of the spacecraft travel.

—Air Marshal Arjan Singh, Chief of Air Staff, India

Congratulations on successful moonflight and happy return. New Years greetings.

—Astronomers Yuroshnikov, Esipov, Kardashev, Pikelner and Yuslysh, Moscow USSR

Heartiest congratulations on your fabulous success and safe return. Warmest regards.

—Prince and Princess of Monaco

Bozo McKee and I want to extend our warm congratulations to you and your people on a fantastic accomplishment.

—Bennie Schriever, General-USAFA Ret.

Please express our congratulations and best wishes to the American cosmonauts and to all co-workers of the splendid journey to the moon.

—Dr. Malcik, President, Commission on Aviation and Space Medicine, Czechoslovak Medical Society, Prague

The journey of Apollo VIII was a scientific accomplishment of unique historical importance. This mission has demonstrated that men of competence and courage will continue to push back the unknown to the betterment of us all. Welcome home and well done.

—General Earle S. Wheeler, Chairman, Joint Chiefs of Staff, Washington, D.C.

Officers and men of A Company (Cheshire) Mercian Volunteers, Army Volunteer Reserve, salute you and your fellow astronauts on your historic moon journey. A magnificent achievement.

—The Armoury, Stockport, Cheshire, England

Please convey to astronauts Borman, Anders and Lovell my delight at their achievement. I recall that during my visit to the Manned Spacecraft Center in 1966 I learnt with interest of the plans for the Apollo space missions, and the occasion was made particularly memorable for me when I received the Union Jack which had circled the World in Gemini VII. Since then I have taken a direct and personal interest in the Apollo programme. I have therefore been particularly gratified by the safe return of the three astronauts from their hazardous mission and would wish to convey to them my congratulations on this historic occasion.

—Prince Philip, United Kingdom

Together with peoples of the world, the Hungarian people followed with great interest the flight of Apollo VIII. The deed of three brave astronauts is a milestone in space research and a magnificent victory of our times. Sincerely wish that they should serve by scientific exploration the cause that humanity is longing for, that is, peace.

—Scientific Committee, Hungarian Peace Council, Budapest

Our congratulations on another technical milestone. We have followed the progress of your flight each day. We congratulate the American scientists and all the American people. We wish you further success on all other flights. We are confident future exploration of outer space will greatly benefit earthly men. We congratulate you on a successful step on a noble goal.

—Soviet Cosmonauts Gherman Titov, Alexei Leonov, Konstantin Feoktistov, Boris Yegorov, Pavel Belyayev, Valentina Nikolayeva, Andrian Nikolayev, Valery Bykovsky, Pavel Popovich and Georgi Beregovoi.

Pass 20-Year Mark



Merritt J. Bender
Lunar and Earth Sciences

Angeline S. Duke
Flight Control



Melvin Bloomberg
RASPO-Downey

John Kornegay
RASPO-Downey

The Roundup is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

Director Dr. Robert R. Gilruth
Public Affairs Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

UofH Course Sign-Up Scheduled January 24

Today is the deadline for MSC employees to submit applications for training to attend 1969 spring semester courses of the University of Houston Clear Lake Graduate Center. Form 75s must be in to Employee Development Branch/BP3 by the end of the day and should include a statement outlining the relation of the proposed training to the employee's job assignment and how the training will benefit the government.

Registration for the 15 courses offered will be held January 24

in the Public Information Office briefing room in Bldg 1 from 9 to 11 am and from 1 to 3:30 pm. Registration for late-comers and combination students (enrollees at both Clear Lake and UofH main campus) will be held at the same location January 31 from 9 to 11 am. Combination students must first register on the main campus and show their student program forms and fee slips when they register for Clear Lake courses.

The spring schedule of courses offered at the Clear Lake Graduate Center is as follows:

Course No. and Title	Time and Days
EE 632B - Advanced Statistical Communication Theory	4-5:30 pm (T-Th.)
IE 363 - Engineering Statistics I	7:30-9:00 am (T-Th.)
ME 634 - Advanced Heat Transfer II	7:30-9:00 am (W-F)
ME 661 - Advanced Vibration Analysis	4-5:30 pm (T-Th.)
ME 677 - Continuum Mechanics I	4-5:30 pm (M-W)
ME 691 - Engineering Analysis II	7:30-9:00 am (T-Th.)
Math 461A - Integral Equations	3-4:30 pm (T-Th.)
Math 637 - Differential Equations	4:30-6:00 pm (T-Th.)
Math 435 - Partial Differential Equations	3-4:30 pm (M-W)
Math 634 - Theory of Functions of a Real Variable	4:30-6:00 pm (M-W)
Physics 391 - General Astronomy	3:30-5:00 pm (M-W)
Physics 493 - Modern Physics III	3:30-5:00 pm (T-Th.)
Physics 681 - Advanced Mechanics	7:30-9:00 am (T-Th.)
Pol 389 - Topics in Public Admin.	3-6:00 pm (Tuesday)
Pol 638 - Seminar in Public Admin.	3-6:00 pm (Wednesday)

Classroom locations will be announced at registration.

First Tickets to the Moon



ROUND-TRIP FARES—Apollo VIII crewmen James Lovell, Frank Borman and William Anders receive from MSC Airline Traffic Office manager George Weller round-trip airline tickets for the lunar orbit mission. The crew also received a moon shot amusement kit containing gag items such as eye masks to be worn when "sight of fellow travelers becomes too much"; playing cards, in case there was a fourth for bridge; and a notepad and pen for writing notes when not on speaking terms and/or keeping gin rummy scores.

Apollo VIII Flight Logs Long List of Firsts

Apollo VIII, in flying man's first lunar orbit mission, logged an impressive number of space firsts. Among these firsts are:

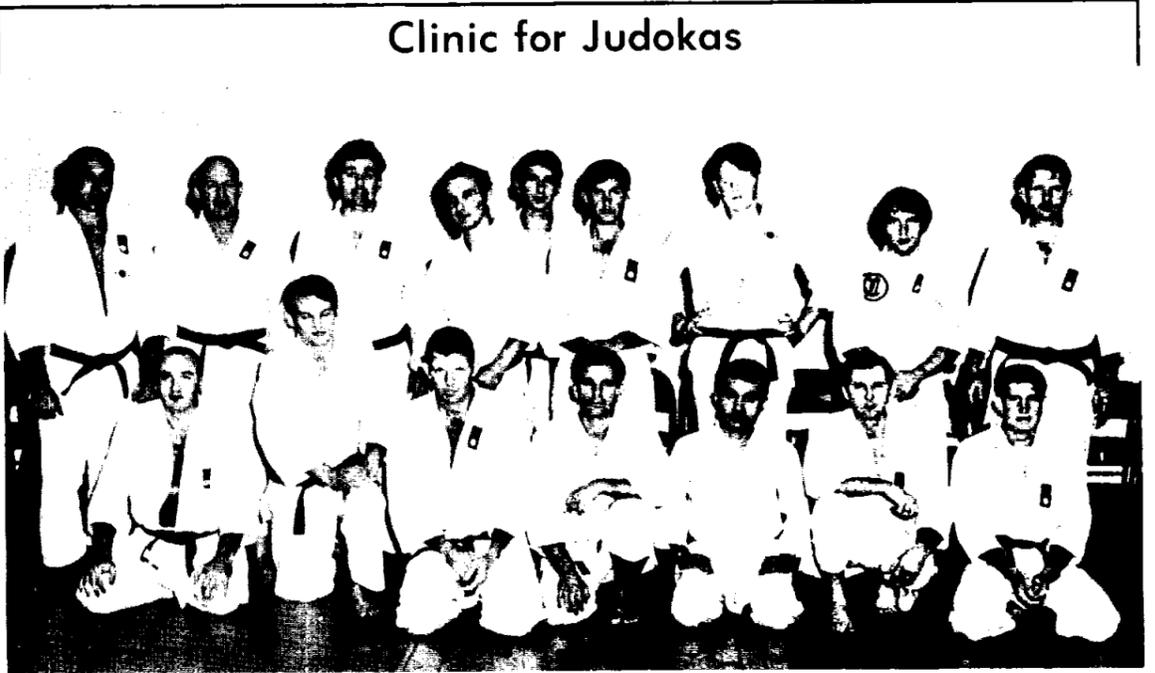
- First time man has been in the influence of a gravity field of a planet other than the earth.
- First time man has traveled as far as 223,000 miles from earth.

- First time man has traveled as fast as 24,171 mph.
- First manned flight on a Saturn V launch vehicle.
- First time man has seen the moon closeup with his own eyes.
- First time man as observed the backside of the moon.
- First time man has photographed the moon close up and returned film images to earth.
- First live television transmissions showing the full earth sphere.
- First manned earth atmosphere entry at speeds of almost 25,000 mph.
- First time man has navigated in cislunar space.
- First time man has been completely out of contact with his home planet.
- First time man has been beyond the protective sheath of the earth's magnetic field.
- First time man has seen with his own eyes the full sphere of the earth.
- First manned operation of the Apollo system under conditions for which it was designed.
- First use of the variable-azimuth launch concept in manned missions.
- First closeup appraisal of the moon's surface by man.
- First voice communications over lunar distances.

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Clinic for Judokas

JUDO WORKSHOP—The MSC Judo Club recently held a techniques clinic with guest instructor Phil Porter, a fourth-degree Black Belt holder, AAU official and Olympics coach. Porter is third from left, rear row. Others in the photo from MSC are club president Dutch von Ehrenfried, far left front row; Yogi Kondo, third from right, front row; and club secretary Perry Ealick, far right, rear row.

Apollo IX Launch Date

(Continued from Page 1)

A manned LM active rendezvous is planned for the fifth day, beginning with a CSM reaction control system separation burn. The LM crew will conduct a series of maneuvers including a descent propulsion burn, LM staging, and ascent stage docking with the CSM some six hours after separation.

The LM ascent stage propulsion engine will be ground-com-

manded to burn to depletion at the end of the day after the LM crew has returned to the CSM.

Three additional SPS burns will be made during the balance of the 10-day mission: two for reshaping the orbit and one to deorbit.

Touchdown is planned in the West Atlantic at 33° NLat x 60° WLong, about 1000 nm east of Cape Kennedy.

Fashion Show Set January 21

"Flight Into Fashion," and evening tea and fashion show, will be presented January 21 at 8 pm at the Nassau Bay Resort Inn. The show will be presented by Delta Airlines in cooperation with MSC Employee Activities Association and wives' clubs of Boeing, Lockheed and General Electric.

Fashions to be modeled include Nardis of Dallas, Cole of California, Lady Arrow, Ailene's and Kor of California. Jewelry is by Coro.

Tickets at \$1.75 each are available from Pam Howell at 4258, Karla Garnuch at 5135 and Mary Dunn at 3941. Tickets are limited and none will be sold at the show.

Roundup Swap-Shop

(Deadline for Swap-Shop classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Ads are limited to MSC civil service employees and assigned military personnel. Maximum length is 20 words, including name, office code and home telephone number. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested.)

FOR SALE/RENT—REAL ESTATE

- 4-2-2 in Clear Lake City, screenporch, fenced, full carpeting, 1 1/2 yr old, \$4000 equity, \$150/mo. J. W. Samouce, HU 8-0406.
- One acre in League City, 300-ft frontage on FM 518. Priced for quick sale. B. Sprague, 932-4363.
- Rent 4-bdr house in Nassau Bay 3-4 weeks Jan/Feb. Dutch von Ehrenfried, 591-4163.
- 3-2-2, 2000 sq ft, central heat/air, fireplace, carpets & drapes, fenced. Assume 5 1/2% loan, \$5500 equity, \$160/mo. \$23, 500. Bob Law, 534-2646 Dickinson.
- 3-1-1 in Gulf Freeway Oaks, 4 1/2% GI, \$92/mo, low equity. H. R. Barr, 649-1751.
- 3-2-2 in Arlington Heights, central heat/air, builtins, fenced, 15 min from MSC. Blaine Murray, 944-6584.

FOR SALE—AUTOS

- 68 Corvette Stingray convertible, blue, white top, 327, air, autotrans, radials, positraction, AM/FM. Jere Cobb, 591-3516.
- Ford Torino GT 69, burnt orange, white interior, V-8 autotrans, air, pwr windows. Priced \$3800, must sell \$2995; will trade. Oczkowski, WA 6-8994.
- 64 Rambler 660 Classic, 6-cyl std shift, air, \$650. B. M. Wood, 591-2373.
- 61 Ford Fairlane V-8, 2-dr, std shift, good condition, \$250. Ed Thomas, 932-4787.
- 62 Renault Dauphine, rebuilt motor in good condition, good second car. Mary Yarbrough, 723-5807.
- 67 Toyota 4-door, radio, air, white w/blue interior, \$1295. Dutch von Ehrenfried, 591-4163.
- 63 Rambler 4-dr 660 Classic, 6-cyl std shift, 22 mpg, one owner, sell for first \$395. Barbara Matelski, 944-1280 after 5.

Seeks Witnesses

Witnesses to the December 30 automobile-bicycle accident at the intersection of Avenue E and Second Street at MSC, or persons who have knowledge of the accident, are asked to call William A. Larsen at 2271.

- 64 Ford V-8 Falcon Futura 4-dr hardtop, radio, air, sell for \$645 loan value. Barbara Matelski, 944-1280 after 5.
- 67 Corvette Stingray 427, maroon, air, 4-speed, positraction, AM/FM. Harold Nitschke, 483-7351.
- 66 Chevelle Malibu sportcoupe, autotrans, air, pwr steer, AM/FM, new tires, \$1495. R. Jones, 474-3510.
- 67 Ford Galaxie hardtop 390 V-8, fully equipped, xlent condition, \$2295. John Tuffy, HU 2-1326.
- 60 Renault, runs well-good work car, \$125. John Tuffy, HU 2-1326.
- 65 VW camper, fully equipped with roof tent, sleeps 4, top condition, \$1295. John Tuffy, HU 2-1326.

FOR SALE—MISCELLANEOUS

- Girls: for a free Pennyrich bra, call Ruby Berka, GR 2-1774 after 5.
- Learn to fly with Aero Club. Cessna 150 \$7/hr wet; C-172 \$9/hr; K-Bonanza \$16/hr. Bob Ward, 877-3187.
- Three guitars, each suitable for Flamenco, classical or folk accompaniment, \$25, \$50 and \$200. Hal Johnson, GR 4-2422 after 6.
- Early American maple livingroom, dining-room and bedroom furniture, 17 pieces. \$350 for all or sell separately. Jo Sapp, 946-8376.
- Well-used girl's bicycle, \$10. R. L. Stubblefield, 877-4745.
- Zenith stereo \$40. Hoover vacuum, \$20. Electrolux vacuum \$25. Custom hi-fi cabinets \$25. Twin bed \$15. Sewing machine \$10. N. F. Smith, OL 8-5223.
- GE washer-dryer combination, yellow, \$50. Set of four wooden slab folding doors, unfinished, \$10. Keener, HU 8-1193.
- Adjustable overload spring stabilizers for most cars with rear leaf springs (Whitney No. 87-5962), \$3.50. Leo Waltz, 591-2286.
- Six-week old housebroken sealpoint Siamese kittens. John J. Thiel, 946-6814.
- Two-year old Appaloosa stallion. Olivia High, 966-1397.
- AKC-registered Beagle puppies, six weeks old January 15. Carole Kloves, 471-0928.
- Orig \$45 taperecorder \$20. Portable chord organ \$15. Unicycle \$12. Crossman pellet gun \$13. Juanice Cloudis, 471-2447.
- 59 35-hp longshaft Evinrude Lark, recently overhauled; 60 40-hp longshaft Johnson

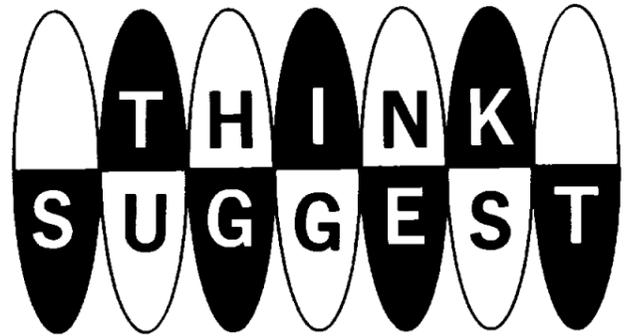
- w/Morse duals and elec harness, spare prop and parts. All \$350. John Cotter, 534-4838.
- 15-hp Evinrude, recently overhauled, one gas tank, spare prop. \$135. John Cotter, 534-4838 Dickinson.
- Two new 3x6-ft plate glass windows in aluminum frame, ready to install, \$15 each. John Cotter, 534-4838 Dickinson.
- 63 Wards washing machine in good condition, coppertone, \$15. John Cotter, 534-4838.
- Minox B camera with flash, tripod, quadrapod, binocular attachmt, projector. New \$330, sell \$225. J. Ross, 946-6738.
- Set of Great Books of Western World and 10-book reference set. Cost \$375—best reasonable offer. B. A. Mabry, JA 2-5764.

WANTED

- Want to join or start carpool from area north of Red Bluff Road and south of La-Parte Fwy, 8-4:30. M. Pettit, 472-1425.
- Three girls to help sell Pennyrich products. Ruby Berka, GR 2-1774 after 5.
- 14-inch bandsaw. Hal Johnson, GR 4-2422.
- Used crib w/mattress in reasonable condition. R. B. Erb, 877-1097.
- Want to join or start carpool from Westbury area, 8:30-5. Evelyn Teeters, 729-2544.
- Old Scout books. L. Klotz, HU 8-1514.
- Need five empty 3-lb coffee cans, will pay 35c each. Ann Hardenman, 471-4776.

LOST

- Grey and white female Saluki (resembles greyhound), wearing brown nylon collar, 23 inches high at shoulder, Friendswood area. Reward. W. R. Greenwood, 481-1179.



AWARDS AND
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PROGRAM

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Melvin F. Brooks, SSP

Jay H. Greene, SSP

William Molnar, SSP

All of Flight Control Division



A NICE PLACE TO VISIT, BUT . . .—The surface of the moon was described as a stark, hostile, forbidding place by the Apollo VIII crew. The large crater in foreground is Goelenius (10° Slat x 45° Elong), with Magelhaens, Magelhaens A and Colombo A clustered at upper left. At upper right is Gutenberg D.



SEA CROSSING—This Apollo VIII lunar photo looks generally northwest into the Sea of Tranquility. The linear feature at center is the Cauchy Scarp, and paralleling it above is the Cauchy Rille. The prominent crater between the scarp and the rille is the crater Cauchy.

Apollo VIII Called 'More Amazing in Fact Than Anticipation'

(Continued from page 1)

168 nm elliptical lunar orbit which was circularized to 60.5x60.9 nm after two revolutions.

Apollo VIII command module pilot Jim Lovell described his impressions of the lunar surface as the spacecraft came from behind the moon on its first orbit. "The moon is essentially grey," said Lovell. "No color. Looks like plaster of Paris. Sort of a greyish deep sand. We can see quite a bit of detail. The Sea of Fertility doesn't stand out as

well as it does back on earth. There's not much contrast between the Sea and the surrounding craters.

"The craters are all rounded off and there are quite a few of them," continued Lovell. "Some of them are newer. Many of them, especially the round ones, look like hits by meteorites or projectiles of some sort. Langrenus is quite a huge crater, and it has a central cone to it. The walls of the craters are terraced, about six or seven terraces on the way down."

During the first lunar orbit television transmission in the second orbit, lunar module pilot Bill Anders commented, "The color of the moon looks like a very whitish grey—like dirty beach sand with lots of footprints in it. Some of these craters look like pickaxes striking concrete, creating a lot of fine haze dust."

The Apollo VIII crew had a full, sleepless schedule of tasks during the 20-hour period of lunar orbit. These tasks included landmark and Apollo landing site tracking, vertical stereo photography and stereo navigation photography, and sextant navigation using lunar landmarks and stars.

The 3522-foot per second transearth injection burn was made on time at the end of the tenth lunar orbit and placed Apollo VIII on a trajectory that required one midcourse correction burn of five feet per second. Two other midcourse corrections scheduled in the transearth coast were scrubbed as tracking showed the trajectory to be near perfect.

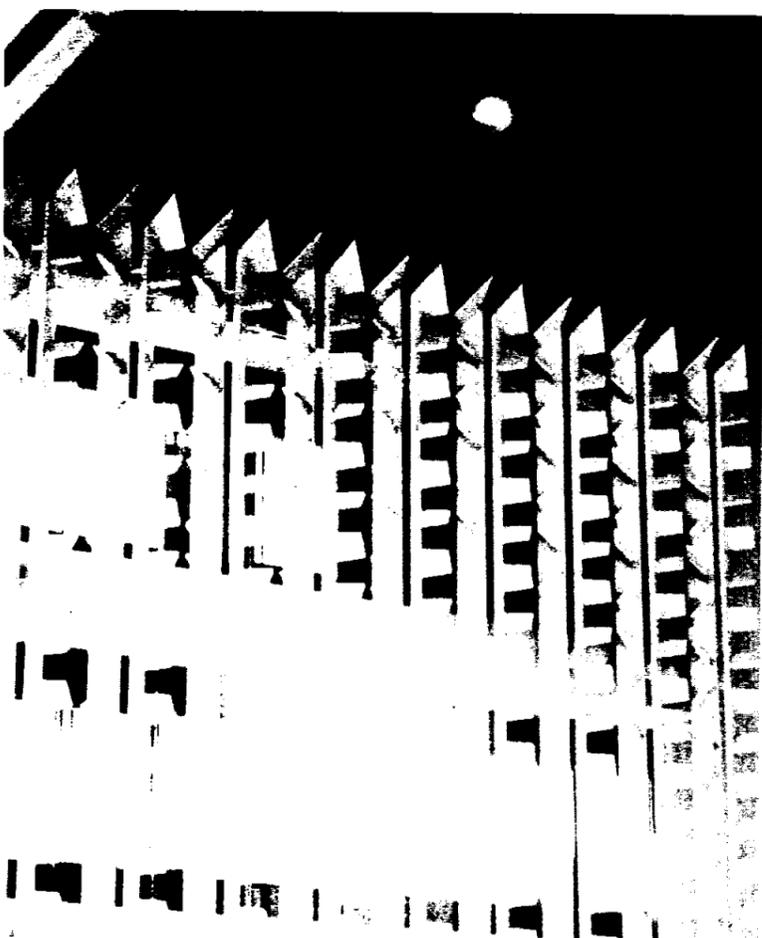
Entry began at 146:46:13 as Apollo VIII penetrated the atmosphere at 36,221 feet per second. Splashdown was at an estimated 5000 yards from the prime recovery vessel USS *Yorktown*, which was steaming in a broad circle around the aiming point.

When asked in a press conference about the lack of anomalies in the Apollo VIII mission, Apollo Spacecraft Program manager George M. Low commented, "On Apollo VII, I kept up a list of anomalies and I looked at it every day and we worked them every day. I think the mark of this flight (Apollo VIII) is that most of us forgot that we even should have such a list. There were a few anom-

alies. They were extremely minor; like I remember Borman reporting one day that his booties were beginning to wear out."

Acting NASA Administrator Dr. Thomas O. Paine said after splashdown, "The impact of this flight on those of us who have been working on this since 1960

is probably greater than on those of you who have thought about going to the moon in your spare time. It's been a full-time job for us and it was even more amazing to us in the actual fact than it had been in anticipation. I feel sure that this flight will have an impact on men's minds and on the future."



LINK WITH EARTH—The moon glows brightly over the decorative grill on the lobby of Mission Control Center during the exact period that Apollo VIII was transmitting television pictures of the lunar surface across 203,000 nautical miles of space.

Apollo VIII Events Box Score

Event	Ground Elapsed Times	
	Planned hr:min:sec	Actual hr:min:sec
Liftoff	6:51:00 am CST	6:51:01 am CST
S-IC stage cutoff	00:02:31	00:02:33.8
S-II stage ignition	00:02:33	00:02:35.2
S-II stage cutoff	00:08:40	00:08:44
S-IVB stage ignition	00:08:44	00:08:45
S-IVB stage cutoff	00:11:28	00:11:25
Insertion, 99x103 nm earth orbit	00:11:38	00:11:35
S-IVB stage restart for translunar injection burn	2:50:38	2:50:37.1
S-IVB stage cutoff	2:55:58	2:55:58
Velocity added by TLI burn	9,998 fps	10,500 fps
Total velocity after TLI	35,566 fps	35,644 fps
S-IVB/CSM separation	3:15:00	3:21:00
Midcourse correction No. 1 (24 fps)	TLI + 6 hr	11:00:00
Midcourse correction No. 2	TLI + 25 hr	Unnecessary
Midcourse correction No. 3	LOI - 22 hr	Unnecessary
Midcourse correction No. 4 (2 fps)	LOI - 8 hr	61:08:54
Lunar orbit insertion burn No. 1 (-2994 fps, 60.4x168 nm)	69:08:52	69:08:52
Lunar Orbit insertion burn No. 2 (-135 fps, circularized to 60.5x60.9 nm)	73:35:05	73:35:05
Transearth injection burn	89:19:16	89:19:16
Velocity added by TEI burn	3520 fps	3522 fps
Midcourse correction burn No. 5 (5 fps)	TEI + 15 hr	104:00:00
Midcourse correction burn No. 6	TEI + 33 hr	Unnecessary
Midcourse correction burn No. 7	Entry - 2 hr	Unnecessary
CM/SM separation	146:34:00	146:31:00
Entry (400,000 feet)	146:49:00	146:46:13
Entry velocity	36,221 fps	36,221 fps
Splashdown	147:00:00	147:00:11